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CONTENTS

CEMA COLLABORATION IN BIOPHYSICS

Budapest MAGYAR TUDOMANY in Hungarian No 4, Apr 82 pp 297-301

[Text] By the 1960's schools of biophysics had developed in the majority of socialist and information exchange has intensified between scientists of those countries. In addition it was evident that equal, up-to-date conditions for accurate instrumental research could not be created everywhere. Therefore, if we wanted to pursue research according to the intrinsic logic of developing science and its practical up to date needs and if we wanted to be in the forefront of research in the world and produce internationally acceptable data, we had to sensible use the intellectual capacities and different levels of instrumentation of various countries. With this understanding in mind at the end of the 1960's, scientists of friendly countries decided to unite their possibilities within an organized framework in order to stimulate biophysical research. As a result of their initiative the Biophysical Collaboration was formed in 1971 within the CEMA framework with the participation of 8 socialist countries--Bulgaria, Czechoslovakia, Poland, Hungary, Mongolia, German Democratic Republic, Romania and the Soviet Union. In 1973 Yugoslavia joined the agreement of collaboration.

On the anniversary, the Council of Representatives of the Biophysical Collaboration of CEMA organized a meeting in which the jointly achieved results of the past 10 years were presented. This was combined with a scientific symposium, an anniversary publication and an exhibit of instruments. The host was the Biophysical Institute of the Biological Center of the Academy in Pushcina which employs about 1,200 people and is the world's largest biophysical research institute, and at the same time takes care of coordinating the collaboration center's tasks.

The Delegates' Council

The highest organ of the collaboration with a decision making power is the Delegates' Council in which each country has an accredited representative. This organization generally meets once a year, but if necessary even more often. The meetings are held in turns in participating countries. Two meetings were held in Hungary, in 1974 in Budapest and in 1980 in the Biological Center in Szeged. The meetings are attended by the accredited representatives, experts of the member countries, the leader of the Coordinating Center and his co-workers as well as by the co-workers of the CEMA

Secretariat. The meetings of the Delegates' Council are the highest democratic forums which develop the program of the collaboration and coordinate various joint activities. Moreover, a scientific symposium covering one of the subjects of the cooperation accompanies each meeting of the council.

Program of cooperation

a) Research Program for 1971-75

The Delegates' Council adopted five major directions of research as a program for the first five years' period, between 1971-75. This program was based upon suggestions from experts on traditions in biophysics of the individual countries as well as new scientific requirements.

Within the framework of the first major direction "Biophysical basis of regulation in biological systems" they studied laws of molecular events within the living organism. They investigated the structure and function of biologically important macromolecules, proteins and nucleic acids, primary events in the transformation of energy derived from the sun during photosynthesis and developed theoretical models for the interpretation of these laws. They clarified many characteristics of the intra- and inetmolecular interaction of biological macromolecules and macromolecular complexes.

As a separate main direction (second main direction) they emphasized the problem entitled "Molecular mechanism and energetics of muscular contradiction." Within this topic large scale investigations are being performed with regard to fundamental phenomena in the functioning of striated and smooth muscles as well as the mechanism of an abnormal heart function and its therapy.

The third main direction provides data for the clarification of "The physicochemical and energy basis of membrane function." Within this main direction besides basic research in determining the laws of bioelectric potential generation, programs of practical significance have also a large role. Among these one should mention the biological production of energy and studies on the effect of drugs (primarily antibiotics) at the membrane level.

The fourth main direction of the collaboration promotes the "Automation of biological research." The collaborating experts' goal is on the one hand automation of measurements of various biological phenomena, but also the development and production of new equipment; on the other hand they developed new methods for processing data with biological information.

The title of the fifth main direction is "Effect of physical factors on biological systems and characterization of the biophysical basis of their molecular and cellular effects." These studies are primarily oriented towards investigations of the effect of ionizing radiation; the analysis of the effect exerted on an irradiated living organism and studies on changes in enzyme kinetics. Significant research is going on in the area of damage caused by UV irradiation on the genetic level.

The collaboration had 22 program items and 28 subitems in the five main direction of its program for the first five years. Eighty-three institutes participated in the realization of the program. The collaboration fulfilled the hopes attached to it. A constructive contact was formed between researchers, the really collaborative work was more frequent, efficacy of research has increased due to labor division and the availability of some unique instruments owned by certain countries only.

b) Long Range Biophysical Predictions and Characteristics of the 1976-80 Collaboration.

In preparing the 1976-80 plan the Delegates' Council has requested an international experts' committee to prepara a prognosis for the development of biophysical research until 1990. By taking into consideration international trends, the work was completed in 1974. The next 5-year plan of the biophysical collaboration was developed by keeping in mind the suggestions of the predictions. The emphasis of the main directions remained the same, the number of program items was 16 and that of subitems 44. The number of participating institutes was 121. For the benefit of operational coordination of research, coordinators were assigned for the five main directions. Coordination of the second main direction was assigned to Hungary. In the collaboration research on muscle biophysics is compiled by the Biophysical Institute of the Medical School in Pecs and the coordinator of the main direction is Joseph Tigyi, full member of the Hungarian Academy of Sciences. The coordinators analyzed the merits of the work in progress of the main direction. The results were reported by the participants on biannually organized meetings of the experts, on symposia, round table discussions and poster presentations. During these meetings the researchers discussed organizational problems and various suggestions and they also prepared the work plan for the next time schedule for the problems of the main directions. Projects in which there was no actual joint research were dropped from the work plans of the collaboration.

During the 1976-80 period three categories of collaboration evolved. In category A projects were completed following strict criteria within the frame of a bilateral contract. Such contracts were signed by institutes and enterprises engaged in developing scientific-technical instrumentation, generally with the common goal to develop instrumentation. The majority of research was done in category B. The collaborating research organizations signed an interinstitutional collaborative work plan which, besides the common project contained also terms for financing and plans for exchange of scientists. The work plan was realized with the use of internal financial possibilities of participating institutes. In category C, connections not fully developed yet were dealt with, primarily via information exchange.

c) 1981-85: Intensive Continuation of the Collaboration

Nine countries and 143 research institutes are participating with almost 500 researchers in the 1981-85 collaborative plan. Eighteen Hungarian institutes--all of nation's significant biophysical research institutes--are participating in the collaboration. (The institutes are under the control of 3 higher

authorities, the Hungarian Academy of Sciences, Department of Health and Department of Education. The Biophysical Collaboration is being supervised by the Hungarian Academy of Sciences.) The participation of Hungarian researchers is significant in each of the main directions of the research program. The collaborative program will be enlarged by a new sixth main direction: investigation of the biological role of water. In 1980 the biophysical research prognoses were supplemented by projections until the year 2000.

Results

We are going to mention only a few of the results: six bit new instruments were developed by the researchers of socialist countries and seven patents were registered. For example they made the Morphoquant, automatic micro-object analyzer with which the formed elements of blood, chromosomes, cell tissues and various dispersion systems can be examined. The instrument was patented in the U.S., Great Britain, West Germany and France and it is manufactured by Karl Zeiss (Jena). They produced a new raw material (polyvalent virulent ohages) for the pharmaceutical industry. A vaccine against staphylococci was obtained by this method and pharmacological and clinical tests were successful. It is useful with good results in acute and chronic diseases and for prophylactic purposes as well. Successful testing of the production of artificial blood is also under way.

The results of basic research are reported in more than 1,550 scientific publications and two monographs printed in 10 years. Most of the publications have appeared in the official journal of the collaboration, "Studia Biophsica."

Planning, Organization of Research

The practical significance of the biophysical program and the efficacy of the joint work is increased by the adoption of a new planning system in the last ten years. Firstly, for practical purposes the realization of concrete, complex tasks and preparation of projects, was assumed by those collectives which are the most qualified in a particular area. Presently two projects are underway, the "Electric field of the heart" and "Biophotometry." The project entitled "Electric field of the heart" will create a new biophysically established complex system of criteria for automated EKG diagnostics. "Biophotometry" is establishing a system of measurements for the evaluation of the biological effect of optical radiation and instruments suitable for mass production. Hungarian scientists are participating in the realization of both projects.

Proof of a more effective organization of research is the formation of base laboratories. In the German Democratic Republic a base laboratory was started which made available complex measuring and data analyzing ESR spectroscopic methods as well as low angle X-ray diffraction methods. In the near future a base laboratory will be established in the Biophysical Institute of Pushcina to comrepehensively investigate biologically active molecules and to reconstruct their steric configuration. To complete the current research tasks the base laboratories have a minimal support personnel and a temporary

international At the anniversary meeting Hungarian and German researchers gave a very successful presentation of a project--the spin labelling of biological macromolecules--performed under the above mentioned circumstances. Current information about the existence of base laboratories in different countries, the thematic and methodological profiles of institutes participating in the biophysical collaboration, their research possibilities and organizational structure, can be obtained from the periodically published and revised Informational Guide, which is put together by the Coordination Center.

Biophysical Training of Cadres in CEMA Member Countries.

Finally it is worth mentioning that the countries participating in the collaboration came together from time to time to discuss training of cadres and their continued education. In 1973 a meeting of experts convened to analyze in detail this problem. This material was published in a special volume. It contained the biophysics curricula and requirements at the universities of member countries and informed about the differences in qualifying systems. The desire was expressed to standardize studies and to have the same requirements for the theoretical studies of biophysicists in the accreditation process. Unfortunately, in this area we are not very successful since the training and continuing education of experts if the responsibility of several higher authorities; the Council of Representatives has sent its recommendations to the CEMA Secretariat.

CEMA Biophysical Cooperation promotes the professional development of young cadres by organizing courses and symposia. They organize courses yearly on several subjects. By now they have become traditional and are very popular. Such is, for example, the course on radiation biology organized in Czechoslovakia, and the winter course in Poland on membrane biophysics.

Difficulties of the Cooperation

At the beginning the cooperation encountered numerous problems which were more or less solved over the years. These difficulties were primarily organizational and administrative in nature and did not affect research itself. The introduction of the new collaborative forms accompanied by problems associated with the old, rigid administration; to eliminate these serious efforts are needed since it effects legal and financial systems of the various countries.

In many countries, as well as ours the exchange of cadres, was a matter of concern since without this the realization of common research would be impossible. There were difficulties in assuring travel funds with the highest authorities, because foreign trips necessary to realize the program had to be coordinated by someone. In each country such problems were solved differently. In the USSR and Poland a separate budget was assured from central state sources. Distribution of these funds is decided by the accredited representative of the country. According to present practice in Hungary, prolonged stays are financed by authorities of the interested institute, while the

expenses for scientific meetings are covered by the supervisory body of the collaboration, the Hungarian Academy of Sciences.

A recurrent problem of the collaboration has been the question of extent of authority of the accredited representatives. It was evident that the joint work could be more efficient and organizationally improved only if partners countries kept in touch through competent accredited representatives with proper jurisdictional scopes. For the current period of the collaboration this problem has been solved in almost every country.

The introduction of contract supported research has also caused serious organizational and legal problems. Contracts with accurate timing assure the completion of various phases of the work by the partners. Generally, such contracts cannot be applied to basic research. Therefore, legal and financial conditions had to be worked out which could be applied to contracts for basic research. There were also difficulties in preparing further development of existing research contracts. Adequate forms had to be found for the cooperation of research institutes, manufacturing companies, organs of foreign trade and they had to be accommodated to the legal and financial terms of member countries. Even in the current phase the CEMA Secretariat and the respective higher authorities of member countries have several responsibilities with regard to using research and development, and production results, i.e., to further the practical application of achieved results.

Despite the existing problems participants of the anniversary meeting in Pushcina closed with satisfaction the first decade of the Biophysical Collaboration. The Hungarian biophysical researchers were specially honored in that Tigyi Joseph academician was elected in the first foreigner honorary citizen of Pushcina, according to the diploma "...for spreading the achieve-ent ments of Soviet biology in Hungary and other countries, and for his relentless and fruitful work in the Representatives' Council in the area of 'biophysical research' of the CEMA countries and Yugoslavia.

On the basis of the last decade's theoretical and practical results we have every assurance that research of the coming years will enrich science with useful results and will also enrich--directly or indirectly--the economies of our countries.

9968
CSO: 2502/80

PRINTED CIRCUITS TESTING MACHINE DEVELOPED

Sofia TEKHNICHESKO DELO in Bulgarian 15 May 82 p 5

[Article by Engineer Yulian Danchev: "Automatic Testing and Electrical Checking of Printed Circuits"]

> [Text] The Development and Applications Center at the Ruse Printed Circuits Plant has developed a system of hard- and software for ATEK [avtomatichno testvane i elektricheski kontrol; automatic testing and electrical checking] of printed circuits. Originated in order to meet the needs of the plant's basic production, ATEK has proved necessary for all plants producing computer equipment, as well as for proprietors of computer centers. With its help circuit checking and defect detection are significantly speeded up and, what is most important, can be assigned to personnel without special technical skill. ATEK operators are exempt from any obligation to know or use the complex circuitry of the boards or the diagnostic lists.

ATEK consists of the basic IZOT 1009S model and three additional modifications--IZOT 1010S, 1011S and 1012S with which the capabilities of the system are extraordinarily expanded and universalized. The IZOT 1009S takes the form of a panel with a video terminal, testing sockets and built-in electronics. It is designed for testing printed circuits with a small, medium and great degree of integration. With its help testing is done under "good/no good" and "dialog diagnostics" conditions. For the latter case the system is supplied with an "intelligent" clip and tester. The package consists, besides, of a processor with a 32-kilobyte memory, a minidisk storage and a set of testing and applied programs.

The IZOT 1010S, intended for real-time testing of digital circuits, is a modification of the basic model. Not only does it include all the capabilities of the IZOT 1009S, it has a program-controlled clock oscillator and a multiphase clock system. With their help, real operating conditions of the circuits can be simulated. In this sense, whereas, figuratively speaking, static circuit testing and checking is possible with the basic model, with the IZOT 1010S this is now done under dynamic conditions.

Further expansion of the ATEK functional capabilities has been achieved by the IZOT 1011S modification. It is intended for testing digital-to-analog circuits by the

performance of parametric tests, with the possibility of treating each circuit as digital, analog and digital-to-analog. What is new here about the hardware is a 32-point matrix module and a 24-outlet instrument matrix. The package consists, besides, of three standard instruments: a digital voltmeter, a functional generator and a frequency meter.

An important advantage of ATEK is the fact that it has its own well-developed automatic system for the generation of test programs, realized by the IZOT 1012S. Its operation consists in creating a mathematical model of the real printed circuit. This is done by inputting coded data not only about the logic circuit of the board, but also about the integrated circuits used therein. These data are withdrawn from the program library with which the system is supplied. Therein are recorded the data for all the integrated circuits used in the computer equipment produced by the IZOT State Economic Trust. After it creates the mathematical model, the system generates the necessary sequence of test pulses, including a complete test program. This means that the users do not have to be supplied in advance with test programs for all their boards because they can compile them themselves with the help of the IZOT 1012S.

It is of great importance that signal propagation time through the microcircuits of the board can be simulated with ATEK. This is especially important since it makes it possible to allow for the effects of "competition" between pulses. As a result of capacitive and inductive influences, their propagation through the elements of the board takes place in a time that differs in practice from the rated time, which leads to logic errors and ultimately to improper functioning of the printed circuit despite its technical serviceability.

The IZOT 1012S configuration includes a processor with a 96-kilobyte memory, a video terminal, an engineering panel, storages on mini- and floppy disks, and a printer.

In respect of its functional capabilities and the improvement of its technical base, the ATEK system is the first of its kind produced in the CEMA-member countries and has indicators on a par with the best models in the world. The original principles and circuitry solutions which are incorporated in its basis are protected by patents.

6474
CSO: 2202/12

BRIEFS

NEW LASER DESCRIBED--Scientific Associate and Candidate of Physical Sciences Nikola Subotinov, Scientific Associate Petur Telbizov and Scientific Associate Nikolay Vuchkov of the Consolidated Physics Center of the Bulgarian Academy of Sciences have developed a copper bromide-vapor laser. The concentration of copper atoms is obtained by electronic dissociation of copper bromide molecules at a temperature of the active medium of about 400 degrees. In this manner the operating temperature is reduced by more than 1000 degrees as compared with a pure copper laser. Thus the design of the laser head is simplified and the possibility of incorporating it in various laser instruments is increased. The equipment operates in a pulse regime (repetition rate from 5 to 20 kHz). Average output power varies from 0.5 to 10 watts, with the laser usable in medicine as a bloodless scalpel at powers over 4 watts. It operates with two wavelengths: 510.6 and 578.2 nm. The laser can be used successfully in physics, chemistry, biology, etc. It is suitable for laser radar and rangefinders, and its high amplification factor opens up possibilities of creating a laser microscope. [Text] [Sofia TEKHNICHESKO DELO in Bulgarian 15 May 82 p 5] 6474

CSO: 2202/12

SCIENTISTS DISCUSS BIOTECHNOLOGY RESEARCH, APPLICATIONS

East Berlin SPECTRUM in German Mar 1981 pp 6-11

/Roundtable discussion by SPECTRUM staff members Hildegard Hesse and Horst Hoffmann with Guenter Pasternak, member, GDR Academy of Sciences and director, Research Center for Molecular Biology and Medicine; Sinaida Rosenthal, member, GDR Academy of Sciences and staff member, Central Institute for Molecular Biology; Manfred Ringpfeil, corresponding member, GDR Academy of Sciences and director, Institute for Technical Chemistry; Prof Dr Friedrich Bergter, Central Institute for Microbiology and Experimental Therapy; Prof Dr Hartmuth Franz, MD, director, State Institute for Immunization Preparations and Nutrient Media; and Dr Dietrich Meyer, Institute for Technical Microbiology of the Ministry for the Chemical Industry/

/Text/ We often observe, at the limits of a number of scientific areas, advances in knowledge that occasionally give rise to new scientific fields with an intrinsic profile. One such field is biotechnology which is currently developing at the interfaces between medicine, biology, chemistry and technology. This field is not linked solely to concrete tasks for research and application; its development also poses many unsolved problems.

SPECTRUM: Could we briefly characterize the science of biotechnology?

PROF PASTERNAK: As the name itself indicates, biotechnology encompasses the research and application of biological principles and processes, and the conversion of these results with the help of technological procedures. The goal of industrial production is always pursued in this connection. The basis of biotechnology is the production of biomasses, enzymes and certain substances by microorganisms, and plant or animal cells. This also includes microorganisms and cells

in which desired production properties and functions have been obtained artificially by genetic manipulation or gene transfer. Biotechnology has been of economic importance in the food industry for centuries. I need mention only the production of bakers' yeast, beer and wine. However, the production of protein from nonconventional carbon sources, the production of specific enzymes, antibiotics and amino acids, and the effective conversion of natural substances with biotechnological processes have only been on the agenda in this century and especially at the present time. Biotechnology is expected to make major contributions to the solution of energy, raw material and nutrition problems in health and environmental maintenance.

SPECTRUM: It is therefore not exaggerated to have great hopes for the results of biotechnology?

PROF ROSENTHAL: Definitely not. It is generally accepted that biology will play an important part in future scientific and technical progress. What is this based on? In my opinion, there are two developments: First, in recent decades, biology has advanced up to the molecular level of the life processes and provided explanations of scientific laws, especially in connection with the chemistry of cell metabolism, protein synthesis, and heredity and structuring of cellular organelles. Second, there is just at the present time, an increased effort to integrate these molecular processes into more extensive processes.

PROF RINGPFEIL: The economic questions previously mentioned by Comrade Pasternak become more important in the light of these events on the scientific level. What is a more obvious step than finding new technical solutions for the production of raw materials, energy, food and for environmental measures based on scientifically detected possibilities? That is why we are at this time establishing biotechnology as a scientific field, from the effects of which on social practice -- as it was once designated by Professor Klare -- we expect much and hope for even more.

DR MEYER: This should be strongly emphasized, in this case in terms of industry. Industry is justified in expecting basic research to provide knowledge that will make it possible to manufacture new products, and to develop new procedures or use existing ones in a more economical manner. Here, research and practice must make use of domestic resources in the overall social interest. I am thinking primarily of agricultural and forestry raw materials and waste products. To mention only a few examples, this would apply to mass products such as protein and ethanol and to the products of highly refined production processes such as antibiotics, extracellular and

intracellular enzymes and amino acids. On this basis, the results and processes of biotechnology will be implemented in the chemical industry, agriculture and the food industry. This will put us in a position to achieve further development in the structures of these areas and to increase production effectiveness. In this connection, basic research in biotechnology must isolate those processes that make use of the advantages of the effect and substrate specificity of biological processes, and thereby create economic alternatives to chemical processes. This encompasses biosynthetic processes as they are used, e.g. in the Peoples' Republic of Hungary, in the total utilization of corn. This involves chemical, microbiological and biochemical technology for the production of protein, ethanol, fructose and a number of basic chemicals.

SPECTRUM: Biotechnology and the results related to it have received sensational coverage in the Western Press.....

PROF RINGPFEIL: ....this is not surprising if we consider the nature of these publications. Attractive situations like this are used, or better "milked" by the capitalist tabloid press. Objective relationships are exaggerated and efforts that should be taken seriously are praised to the skies. However, our knowledge and experience are perfectly adequate for us to be able to make distinctions. It is clear that large investments are being made in bioscience and biotechnology all over the world. But it is equally clear that not all the problems posed by social practice can be solved with biotechnological methods. The penetration of biological action principles in the material-conversion industry is therefore governed substantially by how and in what areas the requirements of industry can be fulfilled. This undoubtedly necessitates a very complex mode of consideration, which we must develop. Sensational reports are of no help here.

PROF PASTERNAK: To follow this, I would like to make some comments on the strategy of our research even if there are many who take it for a given. In biotechnological assignments, our efforts are of course also geared primarily to economic needs. Our economists deal with these problems and contribute in setting up essentially needed elements in a state that permits conversion to production. We will not work in full scope in biotechnology and its bioscientific fundamentals in line with our research potential; priorities must be established. To accomplish this, we are in close contact with our practice partners, with whom we are already beginning cooperative work in the conceptual phase. However, this course does not mean that we shall direct our efforts exclusively to the demands of industry. The Academy, together with higher education, is jointly responsible for basic research in the

GDR. This responsibility is fulfilled in that our scientists are making advances into new territory at the limits of our present knowledge, even though possibilities for the application of these are not immediately apparent.

SPECTRUM: Biotechnology is therefore also substantially technological science. What does this mean to the construction of scientific apparatus?

PROF PASTERNAK: Application of results presupposes that appropriate installations, apparatus and measurement, control and regulatory technology are available. Automation of processes has made considerable progress as a result of the use of microelectronics, and contributed to augmentation of effectiveness in production. It goes without saying that research and development in this area must keep pace with bioscientific research and vice versa. However, modern equipment of laboratories with materials and apparatus, and pure, biological and radioactive chemicals that are adequate for all needs are also an important prerequisite for the performance of assignments. We have therefore decided to devote greater attention to these problems in order to gain first hand access to important aids via the development of scientific instrument construction in the Institutes and biochemical development and production in special techniques. Original contributions can be expected above all if new methods and technologies are more rapidly accessible to us than to other groups.

PROF BERGTER: Just as the chemistry and physics of the eighteenth and nineteenth centuries constituted a base for the development of important technology, biological research in this century is a base for biotechnology. I would say that there was technology, and even biotechnology, in a very early stage of human society. Professor Pasternak mentioned examples of this in his introductory remarks. However, there is biotechnology only when biology has established the necessary base. Development of biotechnology was greatly stimulated by the production of antibiotics which started after the Second World War. Improvements in technology and cellular performance were undertaken for many years, especially in connection with the classic antibiotics. The Central Institute for Microbiology and Experimental Therapy in Jena participated in increasing performance by carrying out genetic, biochemical and biotechnological studies, but also by seeking new antibiotics to close gaps in human and veterinary medicine. In collaboration with the pharmaceutical industry, the macrolid antibiotic turimycin was developed to the point where an injection product which is indispensable for industrial animal production was made available to veterinarians in commemoration of the Tenth Party Congress.

PROF ROSENTHAL: A few comments on the problem of historical dimensions of scientific development. The beginning of this century was characterized by important increases in knowledge in the area of microbiology, which was translated into modern fermentation technology, the potential of which has still not been exhausted. With regard to our progress in knowledge during the past fifty years, we speak of two revolutions in the molecular-oriented biosciences: the enzyme revolution and, in the past thirty years, the revolution in our knowledge on genetic substances. Knowledge in both areas permitted development in the direction of manipulating these processes. The most recent stage in this development is genetic engineering which has created such a furor. The rapid conversion of basic data into practical goals is made possible by the fact that conventional biotechnological methods exist, e.g. microbial fermentation techniques. In addition to this, there are the new possibilities for specific manipulation of microorganisms. There has, so to speak, been a marriage between the existing technological methods and the new knowledge.

PROF PASTERNAK: With genetic technology, we have of course reached a principle solution that enables us to act in many production areas. To come back to the remark regarding the western press media, I think this explains the great interest of concerns.

PROF RINGPFEIL: We should take into account that genetic technology -- I will leave open to question whether or not this is an appropriate designation -- is part of biotechnology. As is the case with the introduction of any other advance in biotechnical production processes, implementation of genetic technology necessitates that it be looked at in its totality with the aid of the required scientific, technical and economic methods. This is the working method of biotechnology, as of every other technology. We can learn a lot here from chemical technology which is already developed.

PROF ROSENTHAL: But there are also specific biological advantages.

PROF RINGPFEIL: There is no doubt about that. These constitute the specific nature of biotechnical processes and they substantiate the need for biotechnology in addition to other technologies such as, e.g. chemical technology. For example, the specific advantages of biolotical processes over chemical ones lie in their marked synthesis specificity, in the use of heterogeneous and diluted raw materials that were not accessible to date and in the accumulation of substances to protect against natural decreases in concentration. However, these advantages also have disadvantageous effects. Hence, in many microbial processes, energy for the synthesis of new molecules is obtained from the raw material molecule. In other words, while the processes require only a small addition of energy from the

outside, they convert up to 50 percent of the available organic carbon into carbon dioxide and from this produce a considerable quantity of heat which results in an unfavorably low temperature level. It is our intention to make the best possible use of the advantages and to limit the disadvantages as much as possible.

PROF FRANZ: The quantity of products that can be manufactured by biotechnological methods will in the future probably also range from fractions of a gram to many tons. In my opinion, this must definitely be considered. Economic factors play a totally different part in the production of tons of important starting materials than in obtaining potential substances for the protection of health, i.e. for the diagnosis, prevention or therapy of certain diseases. The development of biotechnology poses many new tasks in this respect as well.

SPECTRUM: Where is the main potential for biotechnological research in the GDR?

PROF RINGPFEIL: The GDR has available an entire series of workable potentials in biotechnology. For example, our Academy decided to undertake an outline of basic potentials very early, at a time when the idea of biotechnology in the current sense did not even exist. It is not exaggerated to say that, as a result of this early involvement, we were able to participate in determining the development of this scientific area. Technical microbiology studies performed since the beginning of the fifties by Academy members Leibnitz and Rieche, and also by Hans Knoells, who established antibiotic production in the GDR, have constituted a major portion of this involvement. Today, in the GDR numerous scientific, educational and industrial installations with considerable potentials are active in the area of biotechnological research and development. I hope it will not be considered boasting if I put at the top of the list the Academic Institute for Technical Chemistry which, since 1969, has had its 400 associates working exclusively in the field of biotechnology. I should also like to mention the academic industrial complex of technical microbiology in which the chemical plant construction combine, the Institute for Technical Microbiology of the Ministry for Chemical Industry and our Institute are jointly solving biotechnological tasks.

PROF PASTERNAK: Perhaps we should emphasize once again that the development of biotechnology represents an extremely complex task. At the Research Center for Molecular Biology and Medicine, we are engaged in a number of research projects that involve tasks in genetic engineering, as well as in enzymology, immunology, antibiotic production, nutrition, and plant and animal cell and tissue culture. These can all be classified

as biotechnological research in the broader sense. The potential involved is very extensive; it consists of many groups from almost all of the institutes of the FZMM (Research Center for Molecular Biology and Medicine) and various higher education facilities. Coordination is effected via the bioscience program in cooperation and synchronization with Comrade Ringpfeil's sphere of responsibility.

SPECTRUM: Is industry sufficiently prepared to take over such complex solutions?

DR MEYER: Economic realization of these extensive research projects requires the further development of working cooperation among industrial installations, academic institutes and higher education. The working out of the next five-year plan provides a good opportunity for establishing the requisite steps. The Ministry for the Chemical Industry together with other guidance organs of our economy is charged with coordinating the development of biotechnical production in the GDR and cooperation with the RGW countries. The necessity for organizing complexes of this kind has been demonstrated using as an example the fermosin process for production of feed protein from diesel fuel. We are at this time just about to start operation of the large scale plant in PCK Schwedt. This experience must be applied to other technology, especially to the manufacture of highly refined products. I am thinking here, e.g. of the production of antibiotics and diagnostic enzymes, a product group which is equally important for maintaining the health of our citizens and for further increasing our country's export capacity.

PROF FRANZ: Perhaps I might mention another example here. At the Government Institute for Immune Preparations and Nutrient Media, we prepare more than 200 products that are very important for health protection in the GDR. We utilize the biotechnological procedures which to date have been considered conventional and classic. However, it is now important to have access to international developments as soon as possible. This applies in particular to the production of antibodies. At present, we obtain these chiefly from immunized animals (rabbits, goats, sheep). However, we hope that we can soon switch -- at least partially -- to hybrid technology. However, this cannot be attained without close cooperation with other work groups. We have therefore arranged with Prof Pasternak that associates from our Institute will be included in his research group in the preparatory phase. These will at first be scientists; technicians will also be included at a later time. We have similar contacts with Prof Ambrosius' group in Leipzig. We thus hope to be able to introduce a new variant of biotechnology at the proper time. The proper time will be when all

scientific preparations have been completed and the material and technical prerequisites have been established.

PROF ROSENTHAL: I feel that a number of tasks must be performed more quickly. Regardless of the area, new technology of this kind, which was mentioned here a number of times, always requires specific new methods, and these must not remain at the information research level for so long. They must be converted more rapidly. These methods must be made available in an intensified manner to scientists in the various fields of application. This means that, in addition to the research programs, there must be a training program. This may not be general; rather, it must be associated with the solution of specific conversion tasks.

PROF PASTERNAK: Our research center is prepared to undertake training and continuing education projects for particularly apt students as well as for scientists in industry-specific research, especially in the field of molecular biology/biochemistry where the method complex would be very greatly involved in genetic engineering. This would also provide ensurance of connections between universities and industry.

SPECTRUM: Does combine formation also entail advantages for cooperation in biotechnology?

PROF RINGPFEIL: There will be further development in the connection to industry to the extent that the combines include biotechnological tasks in their long-term developmental strategy and to the extent that they are prepared to perform a certain amount of basic research themselves. There are some very encouraging examples of this, i.e. the work of the chemical plant construction combine and the Schwedt petrochemical combine. However, there are still reservations here. Basic research can of course not have only short-term goals. It must also generate the spirit and strength for broad-ranging goals. This is the order of the day. It means that the attainment of long-term progress must be related to the skimming off of useful results in such a manner that both requirements can be fulfilled. I think this is the only way that we can meet the requirements ensuing from our Party's planned economic development and its rapid augmentation. Biotechnology can certainly contribute to this. The extent and duration of this contribution depend not least on our efforts, our wealth of ideas, our ability to cooperate and our resoluteness. The preliminary conditions are not so bad: We have capable, internationally recognized research potential. We have combines that have courageously undertaken new developments. There is proven cooperation in both the national and international sphere. And there is a broad gamut of microbiological and biochemical production in a whole series of industrial areas. A base exists on which we can continue building systematically.

PROF PASTERNAK: The party and government have continuously made available to us the means for comprehensive development of bioscientific basic research. We have traditional institutes where biotechnological research has for many years been part of the assignment spectrum. In this connection, I should like to mention the Central Institute for Microbiology and Experimental Therapy in Jena and the Central Institute for Nutrition in Potsdam-Rehbruecke. However, we also have new installations, such as the new laboratory facility that recently started operation at the Central Institute for Molecular Biology. Here, scientists are working on genetic engineering projects and creating the prerequisites for new technologies. In collaboration with the Central Institute for Genetics and Cultivated Plant Research in Gatersleben and the Institute for Plant Biochemistry in Halle, projects are under way dealing with the development of manipulated microoganisms for use in industrial production processes, manufacture of vaccines on the basis of new technologies, and working out of a preliminary course for cultivation research, all with the goal of increasing the yield in plant production. It is estimated that the economic profit expected in the future will be of considerable magnitude.

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HUNGARIAN RESEARCH AT DUBNA

Budapest MAGYAR TUDOMANY in Hungarian No 1, 1982 pp 5-13

[Text] The Joint Institute for Nuclear Research (JINR) of Dubna was established 25 years ago, in March 1956. For the anniversary, the Section of Mathematical and Physical Sciences organized a scientific session on 14 April 1981, in connection with the annual meeting of the academy. The series of lectures presented the work of Hungarian investigators at Dubna, illustrating the influence of the JINR on Hungarian scientific life. Of the reports given, we are presenting, with some condensing, the presentations of members Denes Berenyi and Dezos Kiss.

Investigations in Experimental Particle Physics

[Article by Dezso Kiss, corr. academ., dep. dir. of Central Research Institute of Physics]

The Joint Institute for Nuclear Research

The document concerning the establishment of the Joint Institute for Nuclear Research was signed in Moscow on 26 March 1956. Modern particle and nuclear physics research requires the construction of increasingly larger and more expensive accelerators, reactors and detectors, whose construction and maintenance expenses greatly exceed the capacity of the smaller countries. The mission of JINR is to provide opportunities for research in modern particle and nuclear physics for the physicists of the member states of the socialist camp.

At its establishment, the Dubna institute possessed two accelerators; one at that time was the highest energy accelerator (10 GeV)[1] in the world. The other was a 680-MeV energy synchrocyclotron, which could be used for investigations in nuclear physics. During the past 25 years, this arsenal was enlarged by several cyclotrons suitable for accelerating heavy ions and three pulsed reactors, unique in the world. During recent years, the 10-GeV synchrophasotron is being gradually adopted for the acceleration of high-energy heavy ions, which in many respects is uncharted territory, between particle physics and nuclear physics.

Internationally, Dubna was the first to enter this field. The synchrocyclotron is being rebuilt; it will resume operating in about a year. Meanwhile, the institute established a computer center, which possesses, in addition to two high-capacity American and Soviet computers, three intermediate-R40 and several dozen smaller computers (including several Hungarian ones).

The research staff of the Dubna institute amounts to 6,000 persons (increasing yearly by 60); of them 800 are scientific researchers, about half come from member states outside the Soviet Union. The institute receives a yearly capital investment of 30 million roubles and an operating budget of 16 million roubles. The 11 member states contribute to the support of the institute in proportion to their national income; our country pays 2.65 percent, which in absolute value amounts to 1.3 million roubles.[2] Since its creation, about 200 Hungarian specialists spent time at the Dubna institute for extended work of several years. As a general rule, about 50 Hungarian researchers are working at a given time at Dubna.

Research at the institute follows three main scientific directions: 1. particle physics, 2. nuclear physics, 3. physics of condensed systems.

In all of these areas intensive Hungarian-Dubna joint research work is in progress. In addition to these three main directions, Hungarian researchers have been and are working in several other fields outside the primary areas. In order to cover the whole range, without any claim of completeness, we would like to list some of these projects.

Joint Investigations outside the Main Research Areas

a) At the intersection of shell physics and nuclear physics, Hungarian investigators are working on two subjects in meson physics and chemistry. One of the subjects is the examination of the mechanism of the creation of deuterium-muon molecules. The muon molecules formed from hydrogen isotopes are of interest because of the nuclear fusion catalyzed by muons; they could acquire a practical importance. It has been proven theoretically and checked experimentally that the probability of the creation of the deuterium-muon molecule, which plays an important role in nuclear fusion, exhibits a resonance behavior at a certain temperature.

b) Investigations in nuclear chemistry also have a distinguished past at Dubna. With the cooperation of Hungarian chemists, the organic chemical reactions of the most difficult halogen atom, the unstable astatine (At_{85}), have been studied for decades. The astatine isotopes have been prepared with the help of the synchrocyclotron. It was found that astatine preserves its halogen character in formerly unknown organic chemical reactions.

c) Hungarian staff members also participate in electronic computer and program programming research; specifically they help to raise the overall level of

electronic and computer activities at JINR with the help of instruments manufactured in Hungary. For example, many TPA minicomputers developed at the Central Research Institute for Physics are used at the computer centers of the institute; there are many analyzers and several Videoton VT 1001 type computers used primarily for data processing, similarly designed at the Central Research Institute of Physics. There is a similar situation with the peripheral units. Among the terminals, the Videoton VT 340 type alphanumeric display is found most often at the large computer center of the institute; we encounter also the Sztaki GD 71 graphic displays. In addition to the hardware activity, significant programming software work is also in progress.

On the other hand, our investigators were greatly assisted by their access to to the large CDC 6500 computer at a time when we no longer had the ICT and the R40 computer was not yet available to us.

d) We are also carrying out joint measurements in the field of high-energy nuclear physics. We presented a review about them in the journal FIZIKAI SZEMLE.[3]

Experiments in Particle Physics

Without any claim for completeness, I would like to report briefly on the most important joint scientific investigations in particle physics during the past 25 years.

1. Collaboration on bubble chambers.

a) We started our participation in the particle physics investigations at Dubna in 1958. We participated in the study of the 6-10 GeV/c pulse π-meson interactions by means of nuclear emulsions, on the basis of our traditional experience with cosmic radiation.

b) The first collaboration with bubble chambers[4] involved the 24-liter propane chamber built in Dubna; in this experiment, we examined the properties of $\pi^- p$ elastic interactions in the above-mentioned energy range. This was followed by a study of this reaction in a larger, 1 meter propane chamber.

Since 1966, we participated, within the framework of the Dubna-Budapest-Warsaw collaboration, in the processing and evaluation of the pictures taken with the 24-liter filled xenon chamber. It is a special characteristic of bubble chambers filled with heavy liquids, and in particular of the xenon chambers, that--since they contain an element with a large order number--they are very well suited for the study of processes involving the creation of neutral particles.

Part of the experimental results has been included in the international table on the physical properties of particles ("the periodic system" of particle physics) compiled by Rosenfeld exhibiting good agreement with other experimental results. In addition, the experiment had important theoretical consequences: it led to the development of a new experimental model.

c) We also participated in the development of an automatic installation for the evaluation of bubble-chamber pictures.

d) Our longest and most important collaboration in the field of bubble chambers involved the two-meter propane chamber. We participated in this collaboration from 1970 to 1980. This was the first major international cooperation, in which nearly all socialist countries participated. Nearly 100 investigators from 10 to 13 particle physics laboratories worked on this project. We carried out the first experiment with the 40 GeV/c-pulse π^- meson beam of the Serpukhov accelerator.

Our first important result involved the determination of the average multiplicity of charged and neutral particles created in π^-p and π^-n interactions. At that time, this π^-meson energy was the largest in the world.

In addition to the results of many experiments, not only was such collaboration established among physicists of various laboratories, but a very fruitful relationship arose between the theoretical and experimental physicists--similarly at the international level.

In the second experiment the chamber was irradiated at the Dubna accelerator with 2-10 GeV/c/nucleon pulse, p, α, d, C particles, placing a tantalum disk in the chamber. This offered an opportunity to study the properties of nucleon-nucleon interactions. This again represents a little investigated area, and in spite of the many methodological problems, significant results have been obtained: determination of inelastic scattering; the average multiplicity of the obtained protons, the π^+ and π^- mesons, for various targets in the case of various primary particles. We do not plan to continue this investigation; our earlier participation may be considered a scouting excursion in the field of relativistic nuclear physics.

2. The RISZK (RISC) Experiment[5]

One of the first large installations--with the bubble chamber--in the course of the development of particle physics detectors was the so-called spark chamber. The operating principle of the spark chamber is quite simple. Metal wires are placed facing an electrode serving as a second electrode; we establish a high voltage between the two, creating a field strength of about 20 kV/cm. The chamber is filled with a mixture of helium-neon gas. The particles passing through the chamber ionize the gas atoms along their paths; the generated

electrons and positive ions are accelerated by the electrostatic field, creating an avalanche effect, which ultimately manifests itself in the form of the spark. The series of sparks reflects with high fidelity the track of the particle that passed through, and thus it can be used to determine the trajectory--and in a magnetic field, the pulse--of the particle.

The shortcoming of the spark chamber is due to the long waiting periods (several microseconds) until the generated ions leave the area of the chamber, allowing the chamber to determine other particles. We solved this problem in the following manner: We apply the high voltage on the chamber not continuously but in a pulsed manner. (We switch off the high voltage from the armature about 20 nsec after the primary ionization event). This stops the evolution of the spark about to be created, and only streamers are formed. This presents the advantage that much fewer ions are formed; they can be removed very rapidly from the chamber, enabling the chamber to record a larger number of particles (the dead time is reduced). At the same time, because the dimensions of the streamers are smaller than that of the spark, the coordinates are more precisely determined. Its drawback is that less light is generated than by the spark, thus requiring the use of a special image amplifier tube in such a chamber, amplifying the light intensity about hundredfold. Such a detector is called a streamer chamber.

The world's largest, 5-meter long, streamer chamber has been constructed recently at Dubna. One of the most important characteristics of the completed streamer chamber is that the streamers are so small that the number of streamers formed within 1 cm--i.e., the specific ionization--can be determined, making it possible to identify the particles passing through the chamber. The RISC chamber is placed in a magnetic field in order to determine the pulse; the events occurring in it are photographed. The RISC is a hybrid detector, in which the streamer chamber is surrounded by several counting (scintillation, proportional, Cherenkov) detectors.

Because of the importance of the subject, we report about this instrument and the hadron investigations carried out with it in a special article.[6]

In the measurements already mentioned, we used a so-called visual detection technique; i.e., the events were recorded optically. This fact also determined the form of a collaboration. The photographs obtained during the experiment, recording several hundred thousand events, are distributed among the participating member states; each processes the portion assigned to it in its own domestic laboratory. The processing involves several activities: determination of the track of the particles (geometric reconstruction), determination of the pulse and direction of the thus-formed particles, and finally physical evaluation. The work of the participating laboratories is reconciled at regularly scheduled work sessions.

The visual detectors play an important role in particle physics; however, another type of detector family, the so-called counting detectors, has also been developed. In their case, the events are recorded in the form of an electric pulse on a magnetic tape. Below, I describe three studies of this type.

3. The K^o Regeneration Measurement

At the beginning of the 1970's, it was generally accepted that as the energy increases, the total cross sections keep decreasing, tending toward a constant limit value. According to another generally held opinion, the difference of the total cross section of the particle and the antiparticle tends asymptotically toward zero with increasing energy (Pomeranchuk theorem). At that time, both viewpoints were supported by experimental facts.

The first dissonance in the harmony of the observations appeared during the discovery of the phenomenon called the Serpukhov effect: the total cross sections in the various reactions kept increasing with increasing energy. At the same time, in contradiction to preveious expectations, we did not observe an approach of the particle antiparticle cross section differences in the 20-50 GeV energy range. The problem may be approached experimentally in two ways. One method consists, of course,of the precise, separate determination of the K^+p and K^-p total cross sections within the whole energy range followed by the determination of the differences and study of energy dependence of this difference.

Another, more effective method involves the study of the regeneration of neutral kaons. The regeneration phenomenon itself is as follows. Originally, we had a pure K^o beam at our disposal; if it is applied onto any material, then an anti-K^o appears in the pure K^o beam. As a result, we obtain the difference of the forward scattering of K^o and anti-K^o. The method presents two important advantages over the previous one. On the one hand, the direct result of the measurement is the amplitude difference; the systematic errors appearing in the determination of the absolute cross section do not take place. On the other hand, in addition to the virtual portion of the amplitude difference, its real portion may be also determined, making it possible to carry out an independent check of the Pomeranchuk theorem.

We studied the regeneration of neutral kaons on the beam of the Serpukhov accelerator with the help of a magnetic spectrometer built by the Dubna institute. We carried out our measurements in the 15-50 GeV energy range, using a 3-meter-long liquid-hydrogen regenerator. In the installation, we used spark chambers as coordinate detectors; during the preparatory period, we replaced them with higher time resolution proportional chambers, which allow handling a larger number of particles. The proportional chambers were developed and built at the Central Research Institute of Physics. The

measurements proved that the energy dependence of the kaon-antikaon forward scattering amplitude difference is not in contradiction with the Pomeranchuk theorem.

Beyond the scientific significance of the experiment, I would like to emphasize the administrative or methodological novelty by which the K^0 regeneration experiment opened up a new chapter in Hungarian particle physics investigations. On the one hand, this was the first Hungarian counting experiment; on the other hand, in the Dubna relation we "invented" the collaboration based on magnetic tape instead of the previous one based on film. These experiments illustrate quite well how a small laboratory can offer a contribution of commensurable value of that of leading institutions.

While Serpukhov and Dubna institutes were busy with the construction of the accelerator and of the experimental installation, serious problems arose in the field of software and computer capacity. Beyond their participation in the measurements, the Hungarian physicists played a long-needed role in the development of a completely original program package. The collaboration between the Hungarian Academy of Sciences and the Joint Institute for Nuclear Research is illustrated by the fact that the Hungarian Academy of Sciences provided several hundred hours of machine time out-of-turn on the CDC-3300 computer which just started its operation and was not excessively busy.

4. Deeply Inelastic Muon Scattering

It is well known that, during the 1920's, Rutherford scattered alpha particles on thin metal foils; as a result of this experiment, he succeeded in proving the existence of atomic nuclei. This classical experiment revealed the exact structure of the atom and created the foundation of nuclear physics.

During the second half of the 1960's the SLAC laboratory (United States) carried out experiments similar in principle and in philosophy, using high-energy (several GeV) electrons. The electron scattering revealed a deeper level: the proton is not pointlike but possesses a structure, as if there were small "nuclei," designated as partons in the protons (later it was found that the partons are identical with quarks).

The latest variant of this experiment is being carried out by means of the deeply elastic scattering of muons. The term "deeply elastic" implies that we penetrade very deeply into the structure of the object being examined and study high-pulse transfer processes. The replacement of electrons by muons is significant because the muons may be accelerated to considerably higher energy, while in electrons at very high energies, very high bremstrahlung losses appear. Thus, this modern Rutherford experiment is used to investigate the structure of hadrons. With the help of protons accelerated to 400 GeV by the super-proton-synchrotron of CERN the highest energy muon beam in the world--and at a given energy level, the highest intensity beam--may be created.

The fineness of the resolution of the structure depends on the square of the average transmitted pulse. The experiment in question is able to penetrate in the 300 $(GeV/c)^2$ range, representing a world record. This experimental installation is a typical example of "big science": CERN-Dubna-Saclay-Munich-Bologna contributed about 20 million Swiss francs or corresponding instrumentation and 40 to 50 persons for 8 to 10 years.

The target consisted of a 50-meter-long graphite rod, liquid hydrogen or liquid deuterium. The detector consisted of a 2.7-meter diameter, 50-meter long iron cylinder, weighing 1,600 tons which surrounded the target. In the toroidal magnetic field, the wave-shaped tracks of the muons scattered on the nucleons forming the nuclei of the target are detected with the help of liquid-scintillator triggered counters and proportional chambers. All of the toroidal magnet and about half of the 160 proportional chambers were developed and built at Dubna.

Experiments have been carried out with the help of this installation since 1979. The main problem is the processing of the approximately 10 million events. Even at CERN there are not enough people and capacity for processing such a large volume of data. We just prepared the first final publication based on material from 1979. Thus, the Dubna institute is one of the chief participating partners in this experiment. Several of the Hungarian experimental physicists working at Dubna participated in this measurement, in part at Dubna and in part after several years at CERN. This participation involves cooperation in the experimental process and also the computerized processing of part of the experimental material, either at CERN or at Dubna. Moreover, thanks to the IBM computer of the Hungarian Academy of Sciences, Budapest is able to participate directly in the evaluation effort.

5. The Neutrino Detector

The chief attraction of experiments carried out with neutrinos is that the neutrino is the sole particle participating only in weak interactions. At the same time, the basic problem of experiments carried out with the neutrino is due to the extremely low level of the interaction cross section of the neutrino: its order of magnitude is 10^{-44} cm^2. In view of this, extremely large installations are needed to detect the neutrino. Throughout the world great efforts are made to build increasingly higher efficiency neutrino detectors. During recent years, consideration was given at Dubna and Serpukhov to building a modern, high-capacity, universal modular neutrino detector by the joint effort of the two institutes in order to accelerate the development of neutrino physics. The 50-meter detector weighing 1,000 tons will consist of the following five parts:

a) Scintillation hadron calorimeter (150 m^3), whose task is to measure the energy released in the neutrino interaction and to detect the products of the interaction formed in it.

b) The interactions may be divided into two large groups: one refers to the interaction mediated by so-called neutral currents, and the other, by charged currents. In the first case, no muons are formed; in the second one, a muon is always created. In order to be able to differentiate the two event types unequivocally in the experiment, care must be taken to detect the muons with a high efficiency. In order to ensure this, the scintillation calorimeter is surrounded at every side by a magnetic shell in the form of a rectangular band. This sends back into the detector the muons that are about to leave it.

c) Similarly, for the purpose of detecting the muons, a magnetic muon spectrometer is placed at the end of the calorimeter; its task is to detect the muons generated in the interaction and to measure their pulses. The muon spectrometer consists of 18 4-meter-diameter magnetized iron disks.

d) In order to determine exactly the track of the secondary particles formed during the interaction, coordinate detectors (drift chambers) must be placed between the scintillation detectors of the calorimeter, the individual elements of the magnetic shell and the muon spectrometer; this will enable us to follow the track of the particles. Altogether, there are 120 drift chambers, representing in toto about 16,000 wires. This is a 16,000 wire electronic unit which indicates the complexity of the experimental task, the necessity for miniaturization and the scale of the expenditures.

e) A large block of nuclear emulsion is placed in front of the overall detector in order to take advantage of the benefits provided by the emulsion detector, should the interaction occur within the emulsion. The area surrounding the interaction can be very exactly observed in the emulsion. However, the subsequent fate of the generated secondary particles cannot be traced because they soon leave the emulsion. On the other hand, they can be easily detected later with the help of several coordinate detectors placed behind the block. From the tracks observed there, we are able to conclude at which portion of the emulsion block the intraction took place. This greatly simplifies the processing of the emulsion, where the main problem consists in subjecting the exceedingly large-volume emulsion-- 100 x 30 x 5 cm^3 --to a microscopic study in order to find a few rare neutrino interactions. However, now we possess an "aiming device," which indicates the immediate neighborhood of the interactions with a precision of about 100-micrometers.

Operation of the detector will be initiated at the existing Serpuhkov accelerator, at the maximum energy (76 GeV) of which, about "only" 5-10 GeV neutrinos are expected. Although this does not represent a world record as far as energies are concerned, this range presents advantages. First of all, this energy range represents a no man's land; it was jumped over during development: throughout the world previously much lower, and at present much higher, energy ranges are being investigated. Second, in this spectrum range we are able to reach such a high neutrino intensity only jointly with all the neutrino beams of the world's accelerators.

Disregarding the preceding, the expected application of the detector will depend on the giant accelerator, the 3,000-GeV UNK, now under construction, to be completed by 1990 at Serpukhov. (A modest staff of Hungarian technicians has been participating during the past few years in the planning and construction of some of the control elements of the accelerator).

The Serpukhov institute plans to create a special electro-neutrino-enriched beam. In the normal neutrino beams mostly muon neutrino is found and electron neutrino occurs only in the order of magnitude of 1 percent. If we take advantage of the decay of the neutral kaons, this ratio may be increased to 50 percent.

A broad range of physical problems may be studied with the hlep of the detector. It is difficult to predict which of them will become timely. Based on our present knowledge, we may assume that we will be able to detect the neutrino oscillation, if this is not done somewhere else. The concept of oscillation was proposed by Pontecorvo about 20 years ago. Its principle is that if we have a pure muon-neutrino beam, then after passing through a certain distance, previously absent electron-neutrinos will also appear in the beam. This is true if the mass of the neutrinos is not exactly zero. This problem became especially interesting in recent years: according to a measurement made at Moscow, the neutrino definitely possesses a finite mass. Demonstration of the existence of the oscillation would confirm this measurement and would make it possible to determine the mass.

In any case, the neutrino detector is universal and modular, enabling us to adjust elastically to the examination of the most timely physical problems after completing the device.

Half of the instrumentation will be built at Dubna and the other half at the Serpukhov institute. Serpukhov will ensure the accelerating time, the neutrino beam, the neutrino channel, the scintillation detectors and one-half of the drift chambers. Dubna's task is to prepare the other half of the drift chambers, the magnets and the emulsion vertex detectors. Dubna is very experienced in this field.

Hungarian particle physicists are interested in the grandiose project, which is without any doubt the way of the future. Our participation is made possible through Dubna. Already, several of our staff members are working on the construction of the neutrino detector. This will be also one of the future tasks of the Budapest laboratory.

FOOTNOTES

1. In atomic physics the energy is measured in electron-volts (eV); this is the energy that an electron (or another particle with a unit charge) acquires when it is accelerated under the influence of a potential difference of 1 V. The larger units are 10^6eV = 1 MeV, 10^9ev = 1 GeV.

2. This sum corresponds to the present situation; 25 years ago it was somewhat smaller and reached this level by a slow gradual increase.

3. Janos Ero, FIZIKAI SZEMLE, No 6, 1981.

4. The bubble chamber is a large-volume recipient containing a liquid, in which the liquid is periodically superheated with the help of a piston. If an ionizing particle enters the chamber during this period, the liquid boils along its track; microbubbles are formed. The stream of microbubbles may be photographed (visual detector).

5. Relativistic ionization streamer chamber.

6. G. Pinter, FIZIKAI SZEMLE, No 6, 1981.

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ES 1055/ES 1055 M TWIN PROCESSOR SYSTEM DESCRIBED

Budapest SZAMITASTECHNIKA in Hungarian Apr 82 pp 1, 9

[Article by Dr. I. Sz.: "Robotron Innovations at Leipzig, the ES 1055 M"]

[Text] The ES 1055/ES 1055 M twin processor computer system channel-channel adapter (KKA-ES 4065), the new operator and service console for the ES 1055 processor, the ES 7069 M, the color picture screen system demonstrating new applications possibilities in agriculture and warehouse management, the mini-floppy Robotron K 5600.10 drive unit introduced as an OEM product, the Robotron 238 multi-microcomputer system, the most varied special purpose systems and software program packages are only selected products of the Robotron Combine and its 19 plants, employing 70,000 workers, which astonish visitors to the fair year after year.

In this article we will talk in more detail about the twin processor system and about the mini-floppy drive unit.

The factory is offering the ES 1055/ES 1055 M twin processor system for the following applications areas:

--for nuclear physics, space research, seismological and energetics research and development, with special regard to the utility of the matrix module (MAMO),
--for control and automation of complex, extensive processes, primarily in industry and transportation,
--for reservation and information systems, primarily in the area of transportation, tourism and the hotel industry,
--for automation of commercial processes and maritime and port management,
--for calculating up-to-date results for financial, insurance and meteorological services, and
--for development of complex and comprehensive guidance and information systems, primarily to carry out the tasks of central state and other economic guidance institutions.

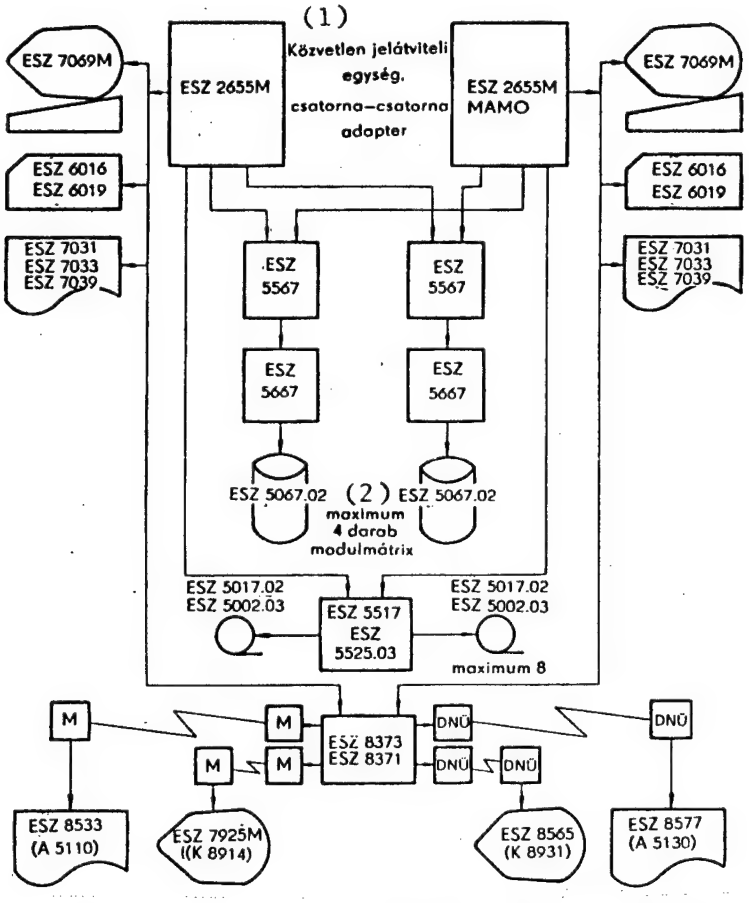
The innovation of the twin computer system was the KKA-ES 4065 channel-channel adapter, the direct signal transmission unit and the two-channel control unit.

The KKA (CCA, channel-channel adapter) helps the user to move large volumes of data while the direct signal transmission unit one can exchange smaller volumes of data between the two computers.

With the two-channel control unit of the external stores the data to be found in the stores can be used by both computers. The system uses a version of the OS/ES operating system adapted to the configuration, which contains a multi-computer support program component. Another important component of the operating system is the asymmetrical multi-computer control system. (The configuration can be seen in the diagram.)

The storage capacity of the data carrier of the Robotron K 5600.10 mini-floppy drive unit, working with a 5 1/4 inch floppy disk, is 125 or 250 K bytes depending on the writing mode (FM or MFM).

Storage capacity is 1 M bits (FM) or 2 M bits (MFM); the writing method is FM or MFM; transmission speed is 125 K bytes per second or 250 K bytes per second; the maximum number of bands is 40; band density is 48 bpi; cycle time is 300 /min. plus or minus 2 percent; rest time is 25 ms; head set time is 40 ms; run-up time is a maximum of 1 second; power supply is plus 12 volts plus or minus 1.2 volts and plus 15 volts plus or minus 0.25 volts; power requirement is a maximum of 20 watts; weight is 1.5 kilograms; and the size is 60 x 200 x 141 millimeters.



(Consists entirely of equipment model numbers except for the following)

Key: 1. Direct signal transmission unit, channel-channel adapter
2. Maximum 4 darab modulmatrix--maximum 4 unit module matrix

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ADAPTION OF IDOS FOR THE VT 60

Budapest SZAMITASTECHNIKA in Hungarian Apr 82 p 11

[Article by Miklos Szabo: "Adaption of the IDOS Operating System for the VT 60"]

[Text] Several years ago, the SZTAKI [Computer Technology and Automation Research Institute], the IDOS (interactive disk operating system) was prepared for the ESZ 1010 computer. The system makes possible a high level conversational operational mode, fast and easy text editing, translation and easy to review documentation.

The IDOS system is known and recognized even beyond our borders; the number of users, who use it every day as a working tool, can be put at several hundred. Its use is easily mastered and it is simple to handle. The reliability of the system--even in the face of hardware and operator errors--is very good.

The IDOS merits attention not only as an independent operating system but also as a developmental tool and special purpose tool. We used IDOS in the development of two big projects, using the system developed for the ESZ 1010 but not the IDOS monitor (in the first case for the RTDM and in the second for a special purpose monitor). According to our estimates use of the IDOS can result in time savings of 40-50 percent, in the given case this means man years.

The VT 60 is the smallest member of the new computer family of Videton (the VT 60, VT 600 and VT 6000), which is the model replacing the ESZ 1010. The architecture and hardware construction of the VT 60 differ radically from those of the ESZ 1010. The VT 60 CPU is somewhat faster than that of the ESZ 1010; its peripherals are activated by intelligent--microprocessor--connections (controllers). These can be managed with a channel program and data transfer is realized with direct memory access (DMA).

The VT 60 has an expanded instruction set, as compared to the ESZ 1010, and has new addressing modes; its memory can be expanded to 128 K bytes. Some of the instructions existing in both machines (for example, string operations) can be used in the VT 60 only with certain restrictions; thus the compatibility of the two machines at the user program level is not complete.

IDOS/60

The IDOS/60 system was born in the SZTAKI as a by-product of network building work. Our goal in developing it was to provide a tool for development of network software on the VT 60 computer. Previously there was no system which efficiently supported developmental work, so we adapted the IDOS operating system to the VT 60. In the course of past years many types of programs were prepared which run under the IDOS system of the ESZ 1010 (cross assemblers, simulators, compilers). Manufacture of the ESZ 1010 has ended; with the adaption of the IDOS these programs will work on the VT 60 also.

We adapted the IDOS with the so-called bootstrap method. First we prepared a reloading program suitable for reloading data files archived under ESZ 1010 IDOS from the ESZ 1010 computer to the VT 60 disk on the serial data transfer line, with the aid of the DTM data transfer system developed at the SZTAKI.

The second step was to prepare an IDOS monitor of minimal size which would run on the VT 60 but was capable of handling only the disk and display. We generated the text editing, translation and monitor object code on the ESZ 1010; alignment took place with the aid of the microprogrammed console of the machine after reloading into the VT 60.

As a third step in the adaption--now working on the VT 60 computer, exploiting the services of the above, so-called MiniIDOS--we wrote and aligned the program handling the other peripherals.

Finally, we prepared the modification of the standard programs and the system documentation.

Peripheral Handling, New Services

At present the system handles the following peripherals:

--a VDT52106 picture screen console, on the serial asynchronous line,
--a VDT52120 operator's picture screen, on the serial asynchronous line,
--an IZOT 1370 disk,
--a MOM floppy disk,
--line printer,
--card reader, and
--a real time clock.

In the course of the development we also created other services:

--automatic restart in the event of disk change and power return,
--emulation of floating point instructions, and
--diagnostics.

In the course of the adaption we rewrote the machine dependent parts of the IDOS monitor (the hardlers) and made minor modifications in the archive and service modules.

In the course of VT 60 implementation of the IDOS it turned out that the biggest problem was not in programming technique but in system technique. Namely, were the presently available (Videoton) displays and connections suitable for use in a system of the IDOS type? The IDOS depends fundamentally on a fast alphanumeric display; the convenience and utility depend on the speed of this. This was available on the ESZ 1010, but the displays can be connected to the VT 60 only via the serial line. The maximal line speed of these is suitable (9,600 baud) but on the equipment available to us (for example, the VDT52120) this could be done only to characters visible to the eye. The execution time of the control characters (cursor movement, screen erase, new line) is slower by an order of magnitude than the speed of the line, so there could be character loss.

Since the VDT terminal family is intelligent (it buffers characters arriving from the line) the usual method in serial data transfer, sending so-called PAD characters, does not help the situation. The compromise solution is appropriate selection of the size of the line buffer (FIFO); which, unfortunately, is small for the equipment mentioned above.

In theory there are three ways to solve this problem:

--modify the microprogram of the terminal,
--radically reduce the line speed, or
--delay completion of the operation with software timing when transmitting the control character.

The first would mean a modification which only the manufacturer could carry out; the second would make the system unuseable; we solved the problem by using the third method.

Further difficulty is caused if the character set of the display and the keyboard is not compatible with that of the VT340 used with the ESZ 1010 (i.e., with the "insert line," "delete line," etc. functions of the 16 line display). In this case also the system programs must be modified. The VDT52120 used fulfills this compatibility but the picture screen console delivered for the VT 60 machines does not.

The floppy disk became the saving peripheral for the VT 60 system, since we did not have a magnetic tape unit. The format used is identical with the IBM 3741 disk format.

Although in the course of adaption we made a maximum effort to maintain compatibility with the ESZ 1010 IDOS we could not do so perfectly for hardware reasons (the deviations, however, are not significant). In regard to its "services" the IDOS/60 corresponds to its ESZ 1010 predecessor. The only innovation --which does not affect the user directly--is that we built a diagnostic module into the system. This administers the number of transfers and errors on the several controls and distributes the load between the CPU and the several connections. We obtained interesting experience with use of the diagnostic module which proved the reliability of the IDOS/60 and which will be useful for optimizing the system (and several standard programs).

The programs and documentation prepared or modified by us in the course of the adaption are:

--VT 60 disk bootstrap loader,
--VT 60 IDOS monitor,
--SYSGEN system generator (floppy disk became the saving peripheral),
--DATAEDITOR program providing system maintenance functions (the management strategy of the display was modified),
--SAVELOAD (saving reload between disk units or onto floppy disk),
--STARTER (an independently running program starter),
--VT 60 IDOS MANUAL, and
--VT 60 SYSMANUAL (containing a description of the hardware-software interface of the VT 60 computer and information about the machine acquired empirically).

According to comparative measurements done with different programs on the ESZ 1010 and VT 60 machiens the ESZ 1010 IDOS system is 10-40 percent faster than the IDOS/60. This is explained by the fact that we use a fixed head disk (MOM) on the ESZ 1010 and a moving head disk unit on the VT 60.

Ideas for Further Development

If Videoton solves the problems mentioned earlier in connection with the operator's display (VDT52120) then there will be no obstacle to preparation of VT 60 TS IDOS (time sharing IDOS). An ESZ 1011 version of the VT 60 IDOS--as an independent system--could be prepared from the IDOS/60 with a few weeks work. Realization of an ESZ 1011 TS IDOS might create an optimal developmental environment for developmental tasks aimed at development of special purpose microcomputer systems, where the hardware characteristics of the machine (1 M byte memory, 20-100 M byte disk) have promising prospects. Nor should we neglect the possibility that only the monitor may have to be written for this, running the existing programs without change under the IDOS systems.

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TPA 1148 DOMESTIC MEGAMINI

Budapest SZAMITASTECHNIKA in Hungarian Apr 82 p 5

[Article by Ferenc Bati, Pal Endrody and Gyorgy Matakovics of the KFKI (Central Pysics Research Institute): "TPA 1148, Domestic Megamini"]

[Text] In the last 4-5 years the TPA 11 minicomputer has been used in virtually every area of the economy. The first configurations, with 32 K words of ferrite ring operational memory and a 5 M byte disk, were followed by systems with 128 K words of semiconductor operational memory and 20-40 M bytes of disk background storage. The number of operating systems already exceeds 100 and according to projections will increase more than three times within 3 years. Systematic analysis of user experiences and a determination of further development goals on the basis of experience are indispensable in growth of such magnitude.

A survey done at the beginning of 1981 pointed to the following applications bottlenecks and newly appearing needs.

In a multiprogramming, multiple user, software development environment 5-6 tasks running in parallel exploit to the maximum the available storage. Adding another work site results in a significant increase in "check pointing" and thus a slowing of response times.

For larger programs (especially for CAD tasks) the 32 K words of virtual memory is a restriction the solution of which with the aid of the overlay technique cannot be done with a good degree of efficiency.

The maximal disk capacity of 20-40 M bytes slowly proved to be too little; the data bases developing in some applications increasingly make necessary the use of disk units with a capacity of 80-100 M bytes.

At more and more institutions they are thinking of creating a network consisting of distributed resources, which will require inclusion in the system of new communication hardware and software modules.

The lack of a floating point processor, decimal arithmetic, string handling instructions, etc. causes problems for an increasing number of users.

On the basis of these things our developmental goals are the following.

The minicomputer development followed thus far must be replaced by development of a megamini computer. There is a need for megamini systems which, being compatible with the TPA 11 machines already in operation, will make it possible to use the user programs without any change while at the same time (by increasing their performance) putting in the foreground a solution of the problems listed above. The first result of this new strategy is the TPA 1148 which, thanks to intensive development solutions, will go into production this year at the Experimental Plant of the KFKI MSZKI and at the Deposit Association of the Experimental Computer Technology Plant in Szekesfehervar.

The most important extra services of the TPA 1148, as compared to the TPA 1140, are:

--Storage capacity can be increased from 256 K bytes to 4 M bytes, since the number of store-resident programs can be substantially greater without slowing the response time. With 1 M byte of operational memory one can run 15-20 tasks in parallel.

--In addition to the Kernel and User mode there will be a third, the Supervisor operational mode, and instructions and data can be put into operational memory separately (I space and D space).

These two hardware expansions make possible an increase in the upper limit of virtual memory (2-3 times), thus one can run 60-80 K word programs without the overlay technique.

--The number of general registers increases from 8 to 16; use of an 8 K byte cache memory (optional) results in further acceleration of program runs.

--A microprocessor background store control family serves to control large capacity magnetic disk and magnetic tape units. The devices adapted are: 80 M byte exchangeable disk packs and fixed disk (SMD connecting surface) magnetic disk units; and 800/1600 bpi recording density magnetic tape units with speeds of 45, 75 and 125 IPS.

--Fixed head disk emulation based on large capacity semiconductor storage elements provides a very fast background storage possibility.

--A multiprotocol, synchronous line interface provides direct hardware connection to the postal data network and hardware support for managing various data transmission protocols; development of a high speed (1 M bit/s) synchronous line interface for building local nets is under way.

--A microprocessor, intelligent operator's console providing remote diagnostic possibilities and carrying out certain "debug" functions helps in the development of a high level man-machine link.

A very essential developmental viewpoint was a study of the possibility of expanding the TPA-1140 systems already installed. Relying on the solutions used in the TPA 1140, the electrical and mechanical design of the TPA 1148 was

developed in such a way that an 1140-1148 conversion is entirely possible. Thus, those users who have "outgrown" their TPA 1140 systems will not be forced to buy an entirely new system; rather, keeping their present equipment, they can convert the central units and expand memory and the peripheral system to the extent needed.

In the course of development we strove for solutions which would make the expansion well founded from the economic side also. This means, for the users, that an expansion from 256 K bytes to 1 M byte will cost about as much as the 256 K byte store cost earlier.

As we mentioned already, the TPA 1148 is compatible from above with the earlier TPA 11 machines; the operating systems and user programs running on the TPA 1140 can be run on the TPA 1148 without any change. In addition, we will introduce an operating system exploiting the new hardware services of the TPA 1148 as well as data base management, transaction processing and network program systems.

We will return another time to a description of the new software tools.

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ASSETS, DEBITS OF THE SZM-4

Budapest SZAMITASTECHNIKA in Hungarian Apr 82 p 3

[Article by Adam Kis: "The SZM-4; What There Is And What Is Missing"]

[Text] By the end of the second year of sales in Hungary of the SZM-4 minicomputer (1981) about 30 units had found owners in our homeland. SZAMITASTECHNIKA has dealt a number of times with this computer model in the recent past. In essence the articles which have appeared contain everything which one can know about it in theory. The article by Lajos Ivanyos (July-August 1981) described, on the basis of practical experiences, the place of the SZM-4 in applications. Still, on the basis of comments at professional meetings and questions from those interested, we must conclude that there are certain misconceptions in connection with the SZM-4 computer due to a lack of information. I do not want to repeat the technical description, because there have been no changes in the principles of the systems. Nor do I want to deal with quality-reliability questions. My goal is simply to report on the possibilities available in 1982, reviewing also those devices and solutions which should be available but which, for the time being, we cannot provide.

How Many Types of SZM-4 Are There?

The SZM-4 model designation does not identify a single definite product, but rather an entire family of products. A computer of similar category and design is made in practically every socialist country. The name of the Bulgarian, Czechoslovak and Soviet product is SZM-4; but the Robotron A 6402 made in the GDR and the Romanian I-100 are compatible with the other members of the family. The SZAMALK [Computer Technology Applications Enterprise] currently sells the Czechoslovak and Soviet systems, but steps have been taken to import systems of Bulgarian manufacture also.

Up to now we have had no way to compare the various SZM-4's. At the moment only machines from the Soviet relationship are in operation; more precisely, the first models from Czechoslovakia are now being put into operation, and there is not yet an agreement on importing the Bulgarian machines.

What justifies parallel trading in the three versions? First of all we must note that these machines are uniform in principle; they were developed after the same prototype, their peripherals are largely identical, the software is essentially the same. But in the course of trading we are expecting something

different from each relationship. The Soviet product is the basic one and will make up the great majority of the imports. The SZAMALK has taken over from the manufacturer the technical servicing of this machine, so it will be possible to change the configurations arriving, adjusting them to the individual needs of the user. We are offering the Czechoslovak product because of its special extra services and more modern technology. In introducing the Bulgarian version our purpose will be primarily to take over from the manufacturer finished applications systems, the so-called special purpose systems (POK) [possibly, Postal Training Center], handing these on to Hungarian users. In the first phase we want to examine the possibility of domestic use of the systems called INFOREG or SZAIT. (These two special purpose systems were described briefly in the September 1981 issue of SZAMITASTECHNIKA.)

What Is The Situation in the Area of Hardware?

The December 1981 issue of the journal describes the composition of the Soviet SZM-4 configurations which can be purchased in 1982. The appearance of the 29 M byte magnetic disk stores and the 16 channel asynchronous multiplexer represents a significant step forward. But it is no less important that beginning this year the Soviet partner will deliver a number of smaller supplementary devices extraordinarily important for efficient operation of the system, such as the bus amplifier and the two line asynchronous adapter which can be built with loop output. (With the aid of the latter the terminals can be placed at a maximum distance of 500 meters from the central machine.) Hardware devices providing machine-machine links (MSZR-MSZR and ESZR-MSZR) are slowly evolving from technical possibilities to commercial realities. Unfortunately, this is not yet true of the software needed for this.

One outstanding innovation of the Soviet system is the semiconductor store, the appearance of which not only increases the reliability of the system but also results in a significant reduction in price; the price ratio of the ferrite and semiconductor stores (with the same capacity) is nearly four to one; that is, one can buy four semiconductor stores at the price of a single ferrite store. The only problem with the semiconductor solution is that it consists of 64 K word modules, so it is not possible to develop small capacity configurations.

We should also mention a few devices in the Soviet offering for which we cannot expect great demand but the appearance of which influences the total picture. One such is the graphic display, which is outstanding for its very low price. There may be interest in a unit called an interface segmentator also, which serves to reduce the burden on the bus, especially when using peripheral equipment which has a large need for operational memory.

Hardware innovations of the Czechoslovak system include the magnetic tape (although this is an innovation only here) and the eight channel asynchronous multiplexer.

In regard to the composition of the Bulgarian systems we know that they are equipped with 29 M byte magnetic disk background stores. But we will be able to provide positive information about this system only when the Bulgarian side makes a foreign trade bid.

It is a common characteristic of the two types of SZM-4 available that in order to avoid superfluous foreign trade activity the shippers leave to the Hungarian trading side the solution of the display problem. In 1982, thanks to an agreement with Videoton, we will be able to deliver to users a suitable number of VDT 52102 picture screen displays. Connecting the picture screen displays presents no problem at present. It must be noted that the above does not apply to the consoles, in both cases the shipper provides these; a VDT 52120 is used in the Soviet systems and the Czechoslovak systems have a picture screen display terminal manufactured by Tesla. In addition to the above it is theoretically possible to include an Orion ADP-2052 display in the system.

The Videoton line printers are essential domestic products; thanks to these it is possible to put together configurations with greater writing speed. These line printers have Hungarian character sets--this is indispensable in certain applications.

Background storage continues to be the critical part of the hardware supply. A significant improvement in this area can be expected in 1983, when delivery of the 29 M byte magnetic disk subsystems may become general. Development of 100 M byte subsystems is progressing reassuringly in Czechoslovakia. In addition to all this it would be advantageous to supplement the background storage offerings with the highly reliable Winchester disks and other modern solutions.

Very great tasks face the developers in the area of minicomputer networks and remote processing also.

SZM-4 Software at the Beginning of 1982

In 1979-1980, when the SZM-4 appeared on the market, it was a great difficulty for users that the basic software delivered at that time did not make possible exploitation of the functional possibilities in the hardware.

This basic software was suitable primarily for technical-scientific calculations, technological process control and laboratory control purposes while the justification for general domestic use of this model was to satisfy data processing and economic application needs.

Results achieved in 1981 far-reachingly justified the preconception for the development of this model. With the aid of the experience available the problems connected with the basic software could be solved quickly. From the end of 1980 the Soviet shipper provided the OSZ RV operating system. Although this operating system cannot be called "data processing software" either, still it was a significant step toward satisfying the needs of users. All the more so because the software team of the OSZV [National Computer Technology Enterprise] (the SZAMALK is its legal successor) developed relatively quickly on the basis of this, as an expanded version of the OSZ RV, the OSZ RV/E, which can be well used for data processing purposes also. This system is being supplemented with elements (data base management, ordering, data querying tools) the existence of which is indispensable in economic applications. Basic software was also prepared for users needing smaller capacity; this is very developed software and can be compared favorably with other well known basic software.

In the area of applications software the great event of the year before us will be the adopting of the SERIES-IV data collection software and the import of the DIAMSZ (MUMPS) data management system from Czechoslovakia, the Soviet Union or Bulgaria.

How to Proceed?

Applications possibilities for the SZM-4 minicomputers require posting such tasks as realization of homogeneous minicomputer nets, the development of SZM-4 based terminals, the development of terminals which can be connected to the SZM-4, the development of highly reliable dual systems, etc. I feel confident in saying that the nucleus for the solution of these tasks exists. One pledge of their realization is MSZR [minicomputer system] cooperation, but we can also hope for much from domestic users, who are showing more and more interest in the SZM-4.

Despite the initial problems appearing in the first years of using the SZM-4 the effective utility of the systems can be established. Thanks to bringing into harmony the functional possibilities and capabilities of the machine and the needs of domestic users it has been possible to create a real market mechanism which can have a crucial effect on both manufacturing and trading policy, forming and standardizing demand for small category computers. So we can hope that a real demand for minicomputers will develop.

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SOFTWARE FRAME SYSTEMS FOR ESZR MACHINES

Budapest SZAMITASTECHNIKA in Hungarian Apr 82 pp 1, 10

[Article by Margit Takacs: "Software Frame Systems for ESZR Machines"]

[Text] Improving the supply of software is a task of great significance and fundamental importance in increasing the effectiveness of the capacity needed to achieve computer technology application goals. In the interest of providing uniform, good quality programs for domestic and socialist import devices modularly constructed frame systems are being compiled based on the software systems delivered with the machines and, where necessary, on elements deriving from capitalist sources and supplemented with domestic developments. On commission from the Computer Technology Applications Main Department of the KSH [Central Statistics Office] the Computer Technology Applications Enterprise (SZAMALK) is developing these within the material framework of the Computer Technology Applications Development Fund.

Our article will give an overview of the frame systems prepared thus far, developed by the Developmental Directorate of the SZAMALK.

Our computer centers operating ESZR [Uniform Computer Technology System] computers--using both ESZR and IBM operating systems--often struggle with compatibility problems between the operating system and the supplementary program products or between the operating system and the hardware. These problems have been solved more or less or they got around them, in almost as many ways as there are computer centers, with wasted effort, individual initiatives and frequent parallelism. Systems modified and supplemented in this way become incompatible and the transfer of program products becomes clumsy. In addition to solving their actual applications tasks, or instead of doing so, the users have had to deal with the development of basic software also.

The Computer Applications Research Institute (SZAMALK is its legal successor), in cooperation with the Computer Technology Coordination Institute, developed a number of frame systems to facilitate the installation, generation, testing and operation of the operating systems used on ESZR machines. By using these one can produce harmony between the hardware, the operating system and the various program products, and this also means that user programs and systems can move more easily between computer centers using the same frame systems. These frame systems ensure the technologization of the process extending from the reloading of the system to the initiation of operation. In addition to methodological descriptions, these also provide procedures and jobs which can be simply and flexibly changed and run in accordance with local needs--with a JCL text editing program. Thus a new system can be generated easily with a sequence of operator activities done according to a scenario.

The frame system is a uniformly compatible collection, based on one basic operating system, consisting of a "starter" which makes generation possible, a pregenerated system, component libraries, a spooling system (programs improving the efficiency of the operating system primarily in handling slow peripherals), various auxiliary tools (procedures and programs aiding installation, generation, testing and operation), separate program products and a system for the conversational mode.

Documentation needed to use the frame systems has been prepared and it contains the functional possibilities of the frame system elements, basic use information, machine devices and procedures.

There is a possibility in the frame systems for use of the program products which can be leased from IBM: PLIOPT, SORT/MERGE, COBOL, etc. (These are not parts of the frame system and can continue to be leased in the usual way.) It is also possible to use other products traded by the SZAMALK (such as SLICK).

The frame system based on IBM DOS/VS was developed in the Software Systems Technical Laboratory of the SZKI [Computer Technology Coordination Institute].

The R34-13 and R34-11 versions of the DOS/VS form the initial operating system; the latter was needed because of the deficient instruction set of some ESZ 1035 machines.

The frame system contains: a system efficiency measurement program based on IBM program products, this improves with new developments the optimal satisfaction of the hardware and software resource needs of the operating system and the applications systems; procedures which facilitate operation and use of the system by operator and user and ensure protection of the system; and a uniform accounting system developed by the SZKI which counts and totals up machine time used in the batch and conversational mode.

The system was prepared in November 1981 for the ESZ 1055, ESZ 1035 and ESZ 1015 computers. An applications description in the Hungarian language is available to the user to aid use of the frame system. Switching to use of the frame system, and this is true of the other frame systems also, goes very easily in general; at a new computer center just getting started it requires only a few hours of machine time and the system can be operated on a regular basis in the first week. If DOS was used earlier on the computer then the brevity of the switchover time depends on the "specialness" of treating the data files on disk. In regard to transfer of applications programs one should consider what changes should be made--simply because the frame system offers new possibilities.

The frame system based on IBM OS/360 21.8F was developed in the Systems Development Main Department of the Computer Applications Research Institute (SZAMALK is its legal successor). Two versions were prepared. One is an MFT pregenerated system for the ESZ 1022 and ESZ 1040 computers, with HASP II. 3.1 spooling and a CRJE conversational mode system. The other is an MVT pregenerated system for the ESZ 1035 and ESZ 1055 computers, with HASP II. 3.1 spooling and a TSO conversational mode system. A number of modifications were made to the basic IBM

OS/360 21.8F operating system: for example, it is possible to use the IEBCOPY auxiliary program with magnetic tape files and not only magnetic disk files; error treatment by the central units of the ESZ 1022 and ESZ 1040 machines was modified; the HASP was made capable of writing out 160 character positions; etc. The following products were developed in connection with the frame system: OLTEP on-line peripheral testing programs; a collection of general purpose PL/I routines; and a program package to check operation.

(As part of the CF-52 remote data processing task the CRJE and TSO conversational mode systems adapted to the frame system were demonstrated for experts at the Csalogany Utca computer center of the SZAMALK at the beginning of March).

The frame system based on the IBM DOS/360 26.3 and POWER II. 4.1 versions was developed by workers at the SZAMKI [Computer Technology Research Institute] (later SZAMALK). The development was done on the ESZ 1022 computer of the SZAMKI and on the IBM 360/40 computer of the Danube Petroleum Industry Enterprise.

In the course of developing the frame system modifications and expansions were performed in the IBM DOS plus POWER system; by correcting design errors in the DOS the user gets a system more convenient to use and simple to operate.

The more essential developments are briefly the following. They eliminated a few job control instructions practically never used and introduced new ones in their place and they modified or corrected a few job control instructions. In order to eliminate the disadvantages deriving from the fixed priority of partitions they introduced time slicing. They modified library management and the machine error interrupt routine; collecting and writing out console messages is on the job listing.

The user can get, as a pregenerated system, a modified IBM DOS plus POWER system for the ESZ 1022. This was prepared on a 2314 magnetic disk for a computer with 256 K bytes of central storage. The pregenerated system contains POWER and a supervisor presuming 512 K bytes of central storage and suitable versions of translator and auxiliary programs are available on tape. Together with the frame they provide programs and procedures aiding installation and operation. As documentation the user receives a general guide, an installation and operation handbook and a volume describing the structure of the magnetic tapes.

Products connected with the frame system are: OLTEP on-line peripheral testing programs and a collection of general purpose PL/I routines.

When purchasing a frame system the user becomes entitled to the use of various services, on the basis of a signed contract. Upon delivery of the system the user gets, in addition to the magnetic tapes and documentation, training and the possibility of consultation. In addition to the basic services other services are provided within the framework of a special contract (for example, installation and tuning). Follow-up and maintenance of the systems is guaranteed after delivery.

They are developing a uniform error reporting, analysis, recording and correction system for the elements included in the frame systems. Errors appearing

during operation are studied, errors made in their own products are corrected, advice is given for eliminating or avoiding other errors and they constantly inform the user about errors noted by others and about the correction of them and new developments are sent automatically.

In the first half of 1982 they will prepare a frame system based on the OS/VS1 system and they are preparing to develop other frame systems also--based on the ESZ operating system.

Medium-range plans included in the CF-52 involve supplementing the frame systems with software module sets for remote processing, offering higher level services. It will thus be possible to compile, in accordance with needs of applications tasks, complex remote processing hardware-software systems consiting of standard components and elements of the frame systems.

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ANTARCTIC RESEARCH ACTIVITIES REPORTED

Geological Research

Warsaw PRZEGLAD GEOLOGICZNY in English No 2, Feb 82 pp 53-57

[Excerpt] The article reports on geological investigations carried out during the austral summer of 1979-80 on King George Island, South Shetland Islands (West Antarctica) under the guidance of the first author [Antoni K. Tokarski]. The main problems elaborated and the preliminary results of the field work are as follows:

1. The geological mapping to a scale of 1:50,000 covered an area of some 200 km^2 round King George Bay and to the west of Admiralty Bay (Fig. 1). Two other geological maps, to scales 1:10,000 and 1:35,000 were made of selected areas of the island for special purposes.

2. Tectonics of Arctowski Mountains--(King George Bay) was studied and collection of data for regional study of mesostructures in Tertiary rocks was completed.

3. New localities of Polonez Glaciation tillites (Pliocene) were found.

4. Vast area of copper porphyry mineralization in Arctowski Mountains was discovered and studied.

5. Pyrite mineralization was thoroughly studied on Keller Peninsula (Admiralty Bay).

6. Zeolite mineralization was investigated in Tertiary rocks.

7. New localities of "Jurassic" and Tertiary plant fossils and of Pliocene marine fauna were discovered.

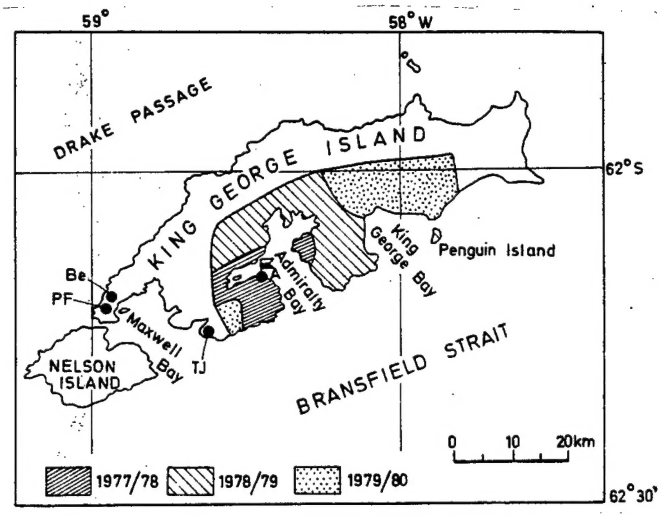

Fig. 1. Areas of King George Island geologically mapped by Polish Antarctic Expeditions.

A – Arctowski Station (Poland, marked by flag); Be – Bellingshausen Station (USSR), PF – Presidente Frei Station (Chile), TJ – Teniente Jubany Station (Argentine).

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[Excerpt]

The paleontological studies carried out in the King George Island, South Shetland Island (Western Antarctica) during the austral summer 1980–1981, were primarily concentrated on highly fossiliferous marine deposits discovered in the Melville Peninsula (Fig. 1). In that area, there is exposed over 200 m sequence of calcareous-marly and, sometimes, somewhat sandy deposits. Preliminary analysis of faunal and floral assemblages showed that the deposits range in age from the Middle to Upper Cretaceous. The deposits were found to yield coccoliths, diatoms, silicoflagellates, foraminifers, corals, bryozoans, polychaetes, gastropods, bivalves, scaphopods, belemnites, ostracods, crabs, asteroids, echinoids, fisches, and they display numerous tunnels made by crabs as well as mass occurrence of coprolites. Vagile benthos clearly predominates in the studies faunal assemblage which appears typical of a shallow shelf zone with relatively quiet sedimentation.

The other important area of studies is situated in the Low Head – Lions Rump region, where marine Pliocene deposits are exposed (Figs. 1–2). Attention should be mainly paid to the lower, Low Head Member (= Pecten Conglomerate), belonging to the Polonez Cove Formation (K. Birkenmajer (2–3)). Deposits of that member are

very rich in fossils, especially coccoliths, diatoms, both benthic and planktonic foraminifers, bryozoans, polychaetes, brachiopods, gastropods, bivalves, scaphopods, ostracods, ophiuroids and echinoids. There were also found algal (? Rhodophyta) encrustations and coatings and single stromatolite structures. Attention should be paid to numerous bivalve layers. Local allochtoneous accumulations of shells of bivalves mainly representing the species *Chlamys anderssoni* (Henning, 1911) may be explained by sedimentary conditions related to heavy storms. It is also worth to note the discovery of three lithological horizons with pholad burrows in the Mazurek Point area. The localities with marine fauna buried in vivo make possible paleoecological reconstructions for the Polonez Cove Formation.

Several floral localities were also revisited and exploited. A large collection of well-preserved imprints of leaves, fragments of stalks and trunks and single pollen were gathered in the Dufayel, Cytadela, Fildes Peninsula – „Mt. Flora", Potter Cove (region of Argentina Teniente Jubany Station) and Mt. Wawel localities (Fig. 1). The Mt. Wawel locality is of special importance on account of the record of the youngest (? Upper Miocene) flora in the King George Island.

In the Low Head – Lions Rump region, Melville Peninsula and Vauréal, paleoglacial deposits were sampled for boulders of sedimentary, especially carbonate rocks of Antarctic origin. Light-coloured varieties of limestones often yield crushed archaeocyathid cups and trilobite armature. The boulders appear completely exotic for the King George Island and preliminary analyses show that they were brought here either as morainic material or deposited as dropstones by icebergs coming from distant Ellsworth Mts or Transantarctic Mts.

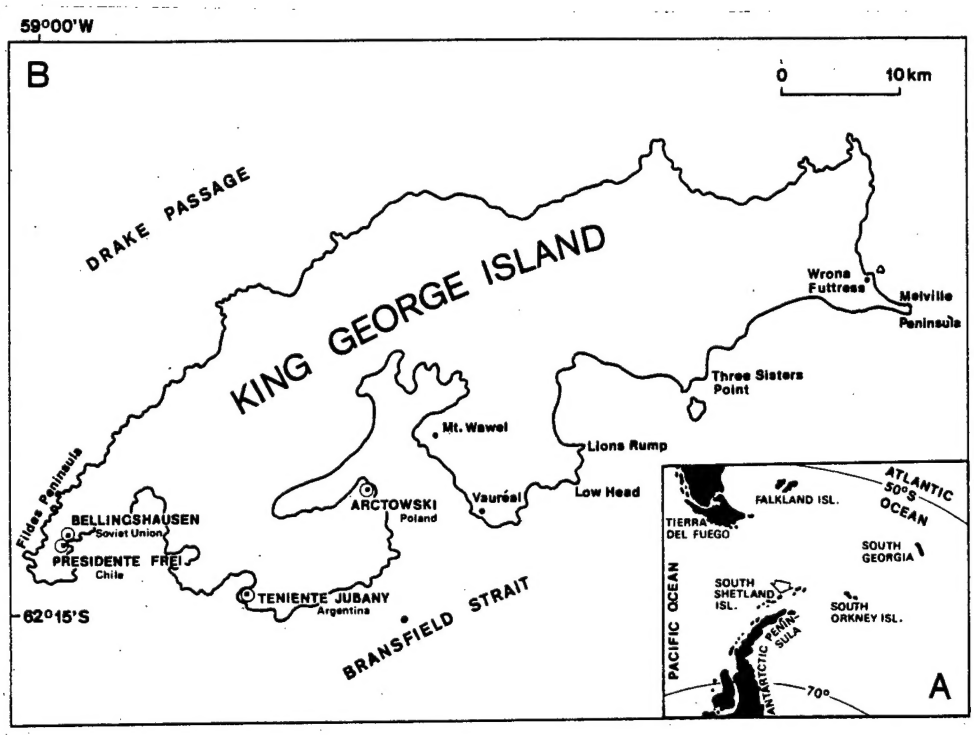

Fig. 1. Map of localities on the King George Island (B), covered by paleontological studies in the course of the Vth Antarctic Expedition of the Polish Academy of Sciences. An insert map (A) shows the location (arrow) of the King George Island in the South Shetland archipelago.

END

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